



Around the Puget Sound, Seattle, Washington, U.S.A.

January Meeting Notice

The Invention of Optical Digital Recording with

James T. Russell

Russell Associates, Inc., Consultants in Optics and
Instrumentation

Co-Sponsored by the AES PNW Section
&

the University of Washington Center for Digital Arts and
Experimental Media (DXARTS)

121 Raitt Hall @ University of Washington, Seattle Campus
7:30pm, Wednesday, January 12, 2005

The "common" knowledge that Sony and Philips invented digital optical recording and reproduction with their introduction of the audio CD in 1982 is perhaps only one misconception of the story of one of the most pervasive technologies of our time.

James Russell can lay claim to having invented much of the underlying technology behind optical recording and playback of digital data - a claim backed by royalty payments that he saw none of.

This fascinating tale of invention (and litigation) will be our January meeting.

In the mid 1960s, while working for Battelle Labs in Richland WA, Russell developed techniques for optically recording digital sound on a disc, card, tape, or plate and reproducing it with a laser. He was awarded patent 3,501,586 in 1970 and the rights were assigned to Battelle.

In 1972, New York venture capitalist Eli Jacobs, sponsored more research. By 1974, working technology for recording digitized color TV onto glass plates was shown at Battelle Labs to interested companies.

Sony and Philips visited Russell at Battelle in 1974 and 1975 before they started work on digital optical, but did not buy licenses. Sony and Philips were thought to have cooperated on the audio CD by about 1977, introducing it in 1982. Philips is also thought to have entered into agreements with MCA DiscoVision in 1974 on the analog video laserdisc. Presently, Discovision Associates claims to own and administer many patents related to optical recording.

In 1980, Eli Jacobs started Digital Recording/SoundStream in Utah to develop an optical digital recording system, using the original patents licensed from Battelle and ones they owned that were filed after January 1972. Digital Recording Corp./SoundStream went out of business in 1985, and the assets were purchased by Optical Recording Corporation in Toronto, Canada. ORC pursued and received royalties on CD player sales

from Sony and Philips for the patents.

In 1992, Time-Warner and other CD manufacturers paid a jury award to ORC of \$30 million for optical disc patent infringement. Mr. Russell had left ORC by this time and received no share. His story and the details of the beginnings of optical digital audio storage and retrieval will be the subject of our January meeting.

About the speaker:

James Russell is a native of Bremerton WA, and received his Physics degree from Reed College in 1953. He worked for General Electric at the Hanford nuclear facility in Richland, WA, Battelle Labs in Richland, Digital Recording Corp. in Salt Lake City, and Optical Recording Corp. of Toronto, Canada. He is currently semi-retired and an independent consultant/inventor in Bellevue, WA. He holds over 50 U.S. patents.

Informative links:

[Seattle Times Article](#) [Reed Discoverer Article](#) [MIT Inventor of the Week](#) [US Patent Office](#) [Early patents](#)

Directions:

The Raitt Hall doors are usually closed at 5pm, so we will have one entryway (doors 10A/10B in tiny black labels at the top of the doors) open for this event. This doorway is on the side of the building facing Denny Hall, which is opposite the grassy quad/cherry trees, to the right as you face the correct side of the building. Signs will be posted around the building.

To get to room 121 you have to go down the stairs as you enter, or take the elevator to level 1 (fully wheelchair accessible).

The University is very large and has many entrances and parking areas. Raitt Hall is on a corner of the central quadrangle, between the Art building and Savery Hall. In all cases, the following directions apply if you drive to the UW:

Stop at the entrance kiosk. Tell the attendant you are attending a presentation at Raitt Hall (not a class). Pay a \$4 fee. Ask for a map, and for directions to your assigned parking area and to Raitt Hall. Parking is strictly enforced until 9pm, so it is inadvisable to buck the system. There are many 7pm classes, so plan accordingly.

The primary entrance to campus is at NE 45th St. and 17th Ave. NE. From I-5, take the NE45th St. exit eastbound. Follow NE45th St. about 10 blocks east until 17th Ave. NE, where the UW is a right (south) turn.

UW maps, general driving directions and parking info are available on the web at: [Map](#) [Driving](#) [Parking](#)

Our meetings are open to anyone interested in Audio. AES membership is NOT required for you to attend our meetings.

Last modified 1/13/2005.

March 17, 1970

J. T. RUSSELL
ANALOG TO DIGITAL TO OPTICAL PHOTOGRAPHIC RECORDING
AND PLAYBACK SYSTEM

3,501,586

Filed Sept. 1, 1966

3 Sheets-Sheet 1

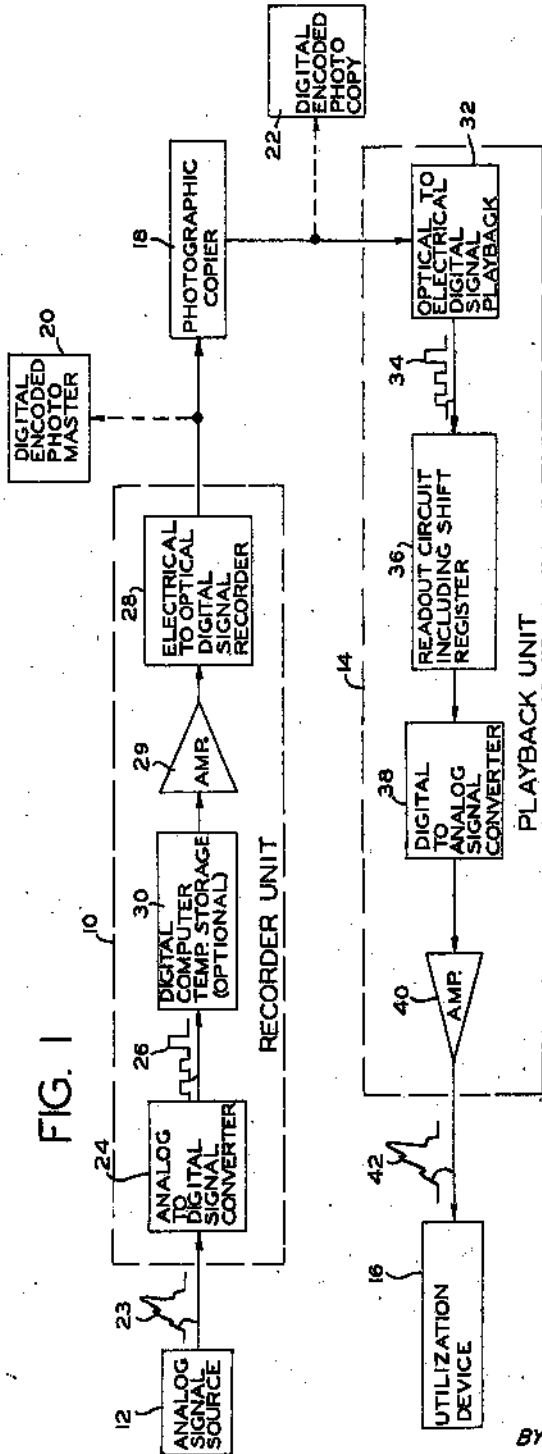


FIG. 1

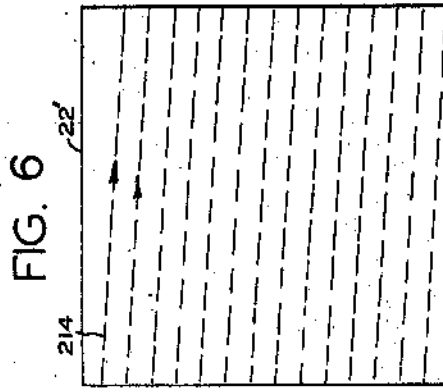


FIG. 6

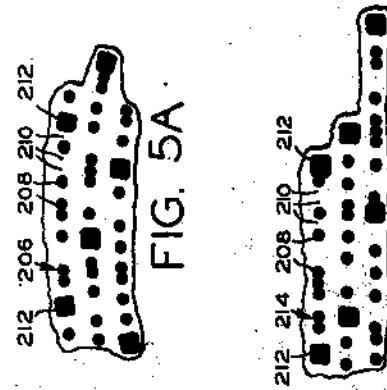


FIG. 5A

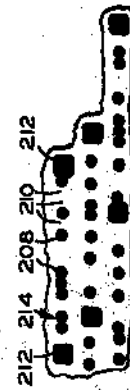


FIG. 6A

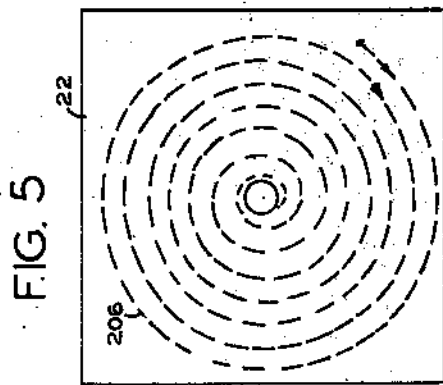


FIG. 5

JAMES T. RUSSELL
INVENTOR

BY
BUCKHORN, BLORE, KLARQUIST & SPARKMAN
ATTORNEYS

[72] Inventor **James T. Russell**
 Richland, Wash.
 [21] Appl. No. **857,474**
 [22] Filed **Sept. 12, 1969**
 [45] Patented **Nov. 30, 1971**
 [73] Assignee **The Battelle Development Corporation**
 Columbus, Ohio
 Original application Sept. 1, 1966, Ser. No. 576,580, now Patent No. 3,501,586.
 Divided and this application Sept. 12, 1969, Ser. No. 857,474

3,138,669	6/1964	Rabinow	179/100.4
3,272,918	9/1966	Koll	178/6.6
3,325,603	6/1967	Rabinow	179/100.41
3,337,718	8/1967	Harper	250/219
3,379,095	4/1968	Kaprelian	179/100.3
3,437,394	4/1969	Hatcher	178/7.6
3,437,814	4/1969	Zuckerbraun	178/7.6

OTHER REFERENCES

Optical Processing of Information, edited by D. Pollock et al. Baltimore, Spartan Books, Inc., Q327 S92 pp. 181-182

Primary Examiner—Terrell W. Fears

Assistant Examiner—Howard W. Britton

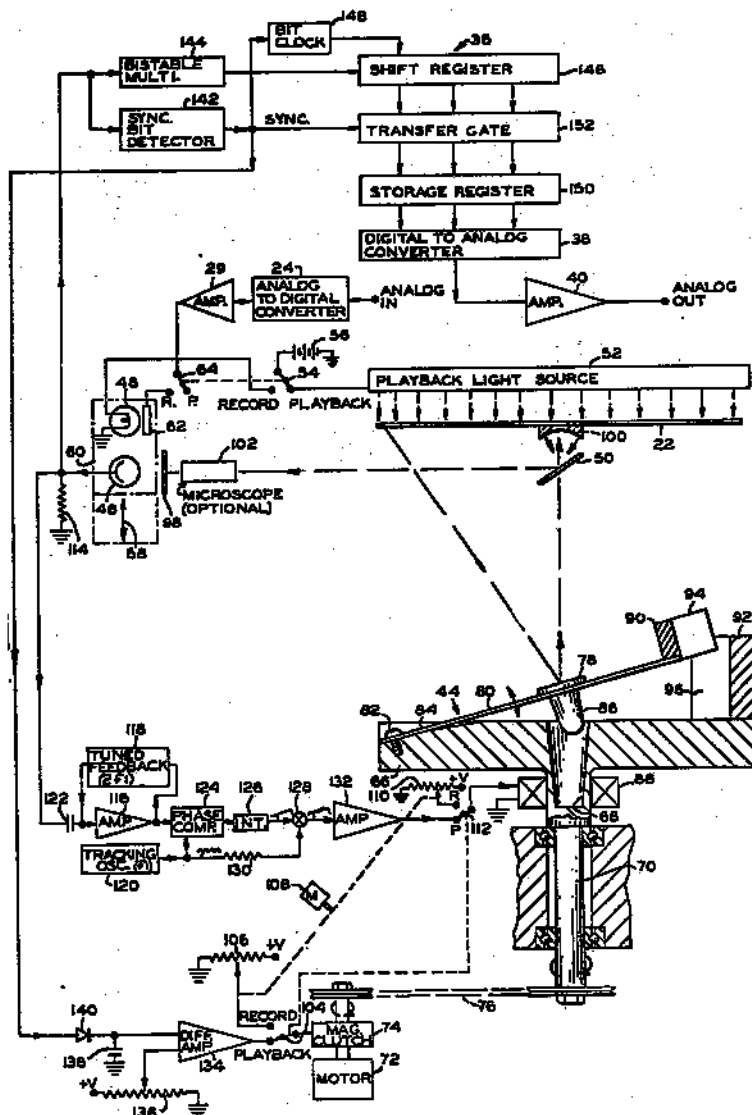
Attorney—Buckhorn, Blore, Klarquist and Sparkman

[54] **PHOTOGRAPHIC RECORD OF DIGITAL INFORMATION AND PLAYBACK SYSTEM INCLUDING OPTICAL SCANNER**
 18 Claims, 8 Drawing Figs.

[52] U.S. Cl. 178/6.7 A, 178/7.6, 179/100.3 D, 235/61.11 E, 250/219 D, 250/219 DD, 350/285, 340/173 LM
 [51] Int. Cl. G02f 2/00, G06k 7/016, G11b 7/00
 [50] Field of Search..... 178/6.7, 6.7 A, 7.6; 179/100.3 D; 340/173 LM; 235/61.115; 250/219 Q, 219 D, 219 F; 350/285

[56] **References Cited**
 UNITED STATES PATENTS
 2,971,054 2/1961 Holt ...

ABSTRACT: An electrical signal-recording and playback system is described in which an analog input signal is converted to a digital signal that pulses a light source to form a single, series-recorded track of binary coded digital information including information spots arranged in groups separated by synchronizing spots recorded on a photographic film which is played back in a similar manner. The photographic film is a compact, permanent record of long, useful lifetime which may be photographically copied to provide a plurality of inexpensive copies. A spiral track photographic record is used in one embodiment which can be employed to provide a music system of high quality.



[54] OPTICAL SCANNER

[75] Inventor: James T. Russell, Richland, Wash.

[73] Assignee: Battelle Development Corporation, Columbus, Ohio

[22] Filed: Oct. 12, 1973

[21] Appl. No.: 405,770

Related U.S. Application Data

[60] Division of Ser. No. 202,471, Nov. 26, 1971, Pat. No. 3,806,643, which is a continuation-in-part of Ser. No. 857,474, Sept. 12, 1969, Pat. No. 3,624,284, which is a division of Ser. No. 576,580, Sept. 1, 1966, Pat. No. 3,501,586.

[52] U.S. Cl. 178/7.6
[51] Int. Cl. H04n 1/24
[58] Field of Search.....178/7.6, 6.7 R, 6.7 A

References Cited

UNITED STATES PATENTS

3,501,586 3/1970 Russell..... 178/6.7
3,624,284 11/1971 Russell..... 178/6.7

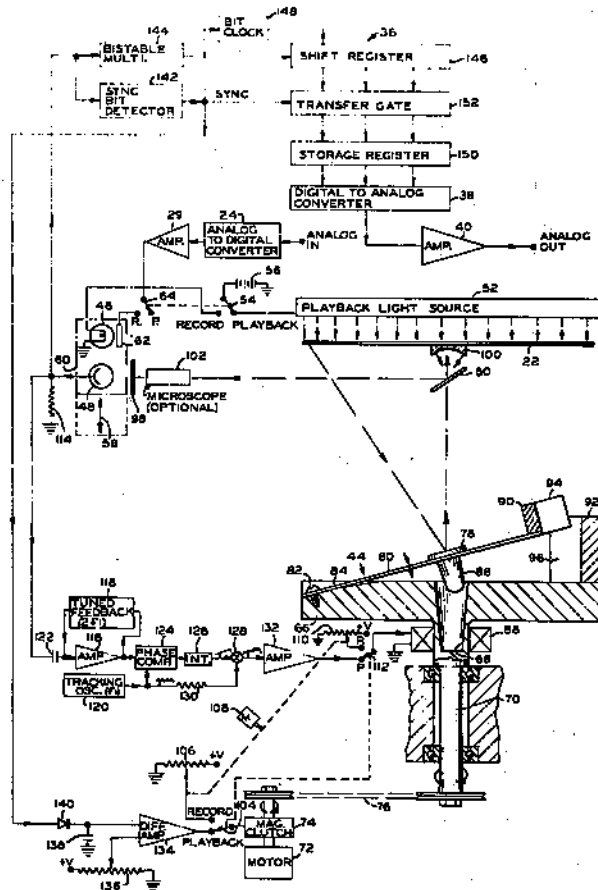
Primary Examiner—Howard W. Britton
Assistant Examiner—Michael A. Masinick
Attorney, Agent, or Firm—Klarquist, Sparkman, Campbell, Leigh, Hall & Winston

[57] ABSTRACT

An electrical signal recording and playback system is

described in which an analog input signal is converted to a digital signal that pulses a light source to form a single, series-recorded track of binary coded digital information including information spots arranged in groups separated by synchronizing spots recorded on a photographic film which is played back in a similar manner. The photographic film is a compact, permanent record of long, useful lifetime which may be photographically copied to provide a plurality of inexpensive copies. A spiral track photographic record is used in one embodiment which can be employed to provide a music system of high quality. In one embodiment, a photographic record having bits arranged in lines or columns is held in a fixed position and a fan-shaped laser beam is moved horizontally over the record in a primary scan, and a row of microlenses focus line segments of the columns in seriatim on a row of photocells, the microlenses being stepped vertically from line to line in a vertical secondary scanning. In another embodiment, a laser beam is scanned horizontally and vertically to illuminate pages of information on a photographic element one after another, and, during the illumination of the pages, a matrix of lenslets, each covering one page, is scanned vertically over the height of a page, to transmit the lines of the illuminated pages seriatim to a row of photocells.

5 Claims, 13 Drawing Figures



[54] METHOD AND APPARATUS FOR SYNCHRONIZING PHOTOGRAPHIC RECORDS OF DIGITAL INFORMATION

3,550,085 12/1970 Silverman 340/173 LM
3,720,923 3/1973 Chen..... 340/173 LM

[75] Inventor: James T. Russell, Richland, Wash.

Primary Examiner—Terrell W. Fears
Attorney, Agent, or Firm—Klarquist, Sparkman,
Campbell, Leigh, Hall & Whinston

[73] Assignee: Battelle Development Corporation,
Columbus, Ohio

[22] Filed: July 2, 1973

[21] Appl. No.: 375,336

Related U.S. Application Data

[60] Division of Ser. No. 202,539, Nov. 26, 1971, Pat. No. 3,795,902, which is a continuation-in-part of Ser. No. 857,474, Sept. 12, 1969, Pat. No. 3,624,284, which is a division of Ser. No. 576,580, Sept. 1, 1966, Pat. No. 3,501,586.

[52] U.S. Cl. 178/6.7 R; 178/6.6 R

[51] Int. Cl. G06k 7/14

[58] Field of Search 178/6.7 R, 6.6 A, 6.6 R;
340/173 LM

[57] ABSTRACT

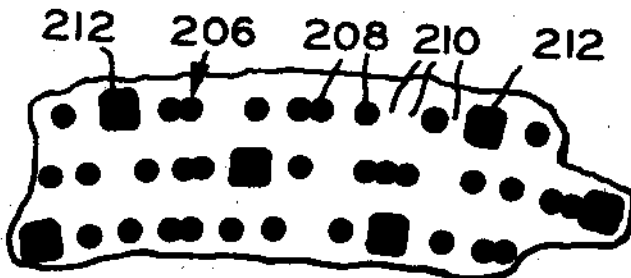
An electrical signal recording and playback system is described in which an analog input signal is converted to a digital signal that pulses a light source to form a single, series-recorded track of binary coded digital information including information spots arranged in groups, which track is played back in a similar manner. The photographic film is a compact, permanent record of long, useful lifetime which may be photographically copied to provide a plurality of inexpensive copies. Recorded information is synchronized for playback by detecting a configuration of the digital signal, either from known characteristics of the signal or from information added to the signal during recording. The information thus read out is suitably employed for shifting digital words in a reassembly shift register until proper word synchronization is achieved.

[56] References Cited

UNITED STATES PATENTS

3,401,268 9/1968 Lea 340/173 LM

16 Claims, 26 Drawing Figures



[54] MULTI-LAYERED OPTICAL DATA RECORDS AND PLAYBACK APPARATUS

[75] Inventor: James T. Russell, Richland, Wash.

[73] Assignee: Eli S. Jacobs, New York, N.Y.

[21] Appl. No.: 727,369

[22] Filed: Sep. 27, 1976

Related U.S. Application Data

[63] Continuation of Ser. No. 516,453, Oct. 21, 1974, abandoned, which is a continuation-in-part of Ser. No. 375,336, Jul. 2, 1973, Pat. No. 3,891,794.

[51] Int. Cl.² G11C 13/04

[52] U.S. Cl. 358/130; 365/127

[58] Field of Search 178/6.7 R; 340/173 LM

[56] References Cited

U.S. PATENT DOCUMENTS

3,191,490	6/1965	Rabinow	340/173 LM
3,848,095	11/1974	Wohlmüt	340/173 LM
3,946,367	3/1976	Wohlmüt et al.	340/173 LM

Primary Examiner—Terrell W. Fears

Attorney, Agent, or Firm—Klarquist, Sparkman, Campbell, Leigh, Hall & Whinston

[57] ABSTRACT

Multi-layered optical data records and playback apparatus are described in which a plurality of optical data layers are provided on at least one side of a record substrate and the playback apparatus scans data tracks

on such layers with a light beam to produce an electrical readout signal corresponding to the data in the scanned tracks. The playback apparatus includes selection means for selectively playing back data tracks on different ones of the data layers. The data track may be formed by lines of data spots of binary coded digital information or such spots may be frequency modulated or pulse length modulated analog information which are photographically recorded at extremely high data density so that they may be used to record audio or video signals including television signals. While the optical data records may be light transparent, they are preferably light reflective so that the playback light source and associated focusing and scanning means may be supported on the same side of the record as the light detector to provide a more compact playback apparatus. This also enables at least some of the same optical elements to be used for transmitting the reflected light beam to the detector that are used for transmitting the playback light beam from the light source to the record. Selection of one data track for playback may be accomplished by changing the focus of the light beam from one data layer to another, or by making the data tracks of optically different materials, such as using different color dyes or different photoluminescent materials, and selectively positioning corresponding color filters in front of the light detectors.

12 Claims, 8 Drawing Figures

